

A pathway from school to university - reaching down to build up

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***Abstract:** The transition from school to university is a challenging one for students. In recent years engineering disciplines have found it difficult to attract secondary school leavers despite the real-world opportunities on offer. This paper describes a program to attract school students to engineering and built environment disciplines by providing them with opportunities to enter a gifted and talented scheme. The scheme involves the delivery of a first year built environment university course to a limited number of year 10, 11 and 12 students. It aims to attract high-achieving school students (especially females) to these programs by allowing them to take a first year course whilst completing their secondary school studies. The paper describes the ways in which the students engaged with their studies, and the support they received from the university and schools. The paper summarises student and staff feedback and concludes by identifying generic strategies that support such initiatives.*

Introduction

This paper describes a partnership between the University of Newcastle and the NSW Department of Education and Training to accelerate career opportunities for students in the built environment. The partnership offered a ‘Career Acceleration Program’ (CAP) to high school students who were committed to a career in these areas. The CAP, which is run in conjunction with Callaghan College, provides a pathway for students from the eight high schools participating in the Newcastle Community Trade Training Centre (NCTTC) to complete a first year university course while attending school. The CAP was piloted during Semester 1, 2010 and is described in this paper.

The interface between secondary school and university, as well as the diverse range of tertiary education options available, is one that bewilders teenagers when they make decisions about their future. They have to make choices based on their limited experience and often in a context of cultural or gender uncertainty. These difficulties compound the challenges these students face when deciding on a career path. If students are “gifted and talented” they face extra pressures of high expectations and an even broader array of career options.

This project was initiated in part to provide students with experiences that broaden their horizons in this decision-making period. The aims of the project were to:

- Provide a diverse range of study options for gifted and talented school students;
- Expose female students to non-traditional pathways;
- Demonstrate to students the diversity of career pathways that exist within the built environment;
- Expose students to online learning experiences;
- Evaluate the potential of such a programme to a wider community.

There are few published studies reporting experiences of high school students studying at university. Those that were located relate to summer school activities where high school students were involved in various activities in universities' science faculties (Atwater, Colson, & Simpson, 1999; Bleicher, 1996; Knox, Moynihan, & Markowitz, 2003). There is thus little precedent against which the CAP may be considered.

Newcastle Community Trade Training Centre

The NCTTC recently received \$12million from the Commonwealth Government to upgrade vocational training facilities in the participating high schools as shown in Figure 1. The CAP provides students with opportunities to fulfil their academic potential, help with career decisions, and potentially leading to credit for future university studies. It is managed by Callaghan College, but is open to students from all NCTTC schools.

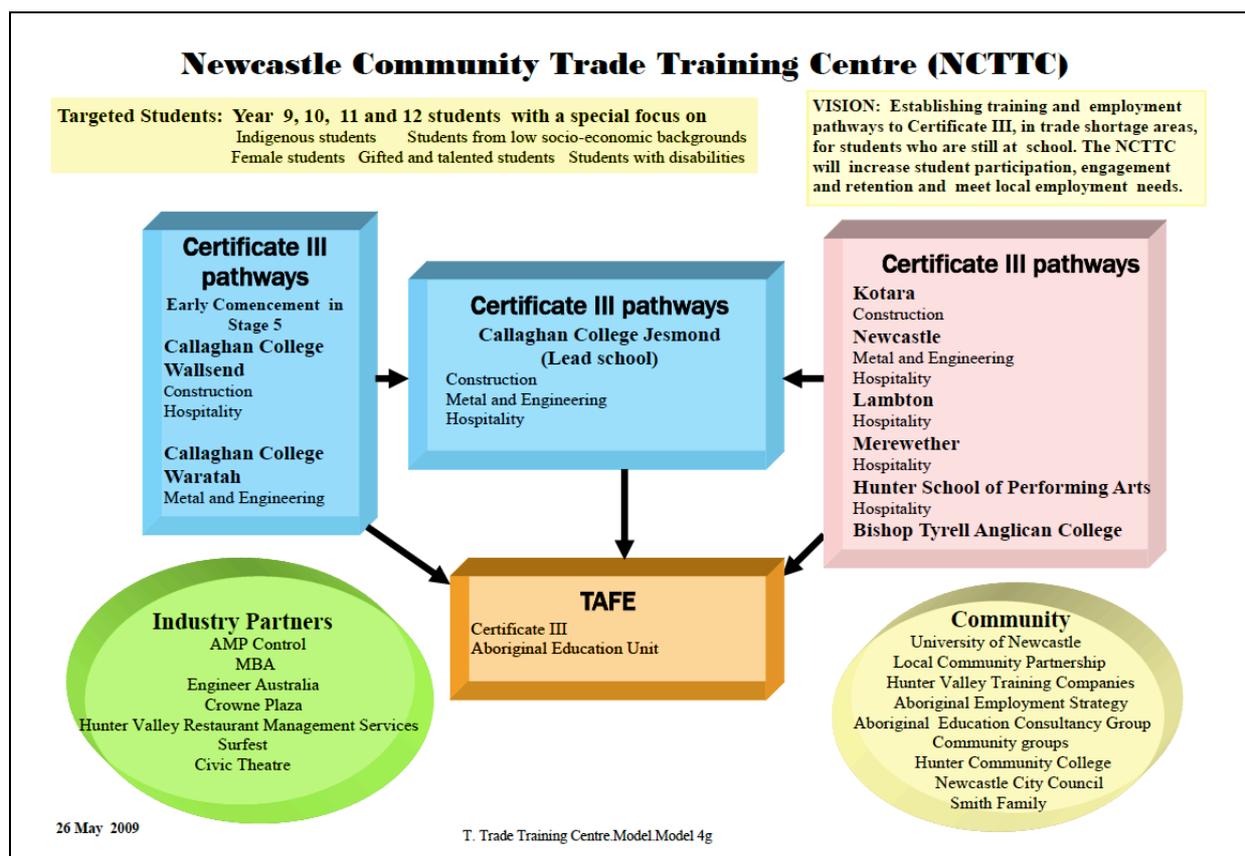


Figure 1: Pathways available through the Newcastle Community Trade Training Centre (Source: NCTTC Governance Committee, 2009)

The project will promote careers in architecture, construction and the built environment, and provide an accelerated pathway to students' career goals. The CAP was promoted to students in Years 10, 11 and 12 in October and November of 2009. Five students participated in the Semester 1 pilot in 2010.

Three students were in Year 10, one in Year 11 and one in Year 12. The gender issue presented itself in the number of female applicants to the project but ultimately only one female student participated in the program. The students who enrolled in the program were chosen through a formal process.

Application Process

As this was a pilot program, the number of students was limited to five. The process of identifying these students was important to both partners and particular attention was paid to publicising the CAP, recruiting students, and managing the various activities involved. The initial phase of the process involved students completing an application form and attaching their latest school report. Shortlisted students were interviewed as part of this competitive process. The University's course coordinator participated in interviews as a member of the panel, contributing his experience of factors that contribute to students succeeding at university. The five students selected were enrolled at the University of Newcastle. They paid a fee of \$400 to cover the management of the program whilst the School of Architecture and the Built Environment paid the remainder of the University's fees. Scholarships were available for students from low socio-economic backgrounds.

Selection criteria

The ongoing viability of such a program is reliant on the success of the initial phase of the program. To this end a set of criteria was established to ensure that suitable applicants were given the opportunity of completing the program. The criteria were based on the characteristics of successful university students. Those used to evaluate applications were:

- Commitment to a career in architecture, construction and the built environment;
- Ability to complete the course in addition to School Certificate or Higher School Certificate studies;
- Commitment to completing the course requirements;
- Time management skills;
- Ability to work independently and collaboratively;
- Appropriate communication and technology skills; and
- Problem solving skills.

Students' perceptions of their abilities to address these criteria (as recorded in their expressions of interest) were provided to the interview panel. These were explored by the panel during the interview and formed the basis upon which offers were made.

The University course

The CAP students were enrolled in a first year course entitled 'Construction Ecology 1'. The learning objectives of this course included students being able to:

- use appropriate terminology to describe materials and their properties;
- define materials properties and their design considerations;
- describe the influence atomic bonding systems have on materials properties;
- use appropriate classification systems for categorising materials utilised in construction;
- acknowledge the environmental implications of materials and their manufacture;
- make informed decisions on the application of materials to defined design situations;
- identify a range of commonly used construction materials and describe the rationale for their application;
- describe the manufacturing processes which provide the predominant construction materials;
- describe the impact of utilising multiple materials in combination.

The course is offered to first year architecture and construction management students, and is often taken as an elective by other students. It is offered in a blended-mode, with on-campus students attending lectures and tutorials face-to-face, and distance learners engaging electronically with recordings of lectures and discussion board postings. The course is based on problem-based learning principles, with students required to investigate real-world problems. Students' progress is monitored and assessed continuously, as described below.

The course was assessed in a variety of ways as shown in Table 1. The first and second portfolios were based on scenarios which called for solutions to construction problems posed by hypothetical clients (e.g. a dog kennel for a family with young children, a retaining wall under a house). Students' solutions focussed on their understanding of their clients' requirements and their selection of materials that appropriately addressed these requirements. The final portfolio required students to identify real-life instances where construction materials had failed, as well as excellent / appropriate use of materials. In all cases students were required to justify their choices and perceptions. In addition, on-line multiple choice quizzes were given each week, following each lecture.

Table 1: Assessment items and weightings

Assessment Item	Contribution
First Portfolio (Scenario 1)	10%
Second Portfolios (Two Scenarios)	50%
Final Portfolio	25%
Online quizzes	15%

Use of the Blackboard online learning environment was key to the CAP. It provided students with the flexibility to avoid timetable clashes between school and university activities, as well as with other school-based activities e.g. excursions, exams etc. In addition, it provided students with the challenge of managing their time and study strategies. Distance-learning is not a foreign concept to secondary school students but the opportunity to study an online course at the university level is novel.

The School Principal's perspective

This CAP is different to other acceleration programs delivered by the University of Newcastle in that the focus is on career development in vocational education and training areas. It provides a seamless pathway to university for gifted and talented students to careers in architecture, construction and the built environment. As students complete a university course before finishing school, they are encouraged to continue their education at university. Students also have a good introduction to the University of Newcastle and the standard of work expected. All of the students in the Semester 1 program indicated that, on leaving school, they intended to continue their studies at the University of Newcastle.

Another unique feature of this program was that students completed the course through online learning. There was no need for them to attend University lectures or tutorials (although one student did attend some lectures).

Students were very excited to be included in the program, but very apprehensive at first. They were assigned a school mentor to assist them with their study program. They also had the support of a Program Coordinator from Callaghan College. A preliminary meeting was held at the University for the students and their parents. At this meeting the students were provided with an overview of the Blackboard Learning Management System and the course and assessment expectations. The students also had another meeting with the course coordinator and the school principal towards the end of the program.

The Callaghan College Principal found the support from University staff to be "outstanding and we had a really effective team that all worked towards enhancing the CAP experience and supporting the students. The benefits for the participating students were amazing. They relished the challenge and were very proud to have successfully completed the course. One parent told me that her son had been changed through his participation in the course and that his self esteem, self confidence and organisational skills had greatly improved".

Lessons learnt from the Semester 1 pilot

The pilot was not without some challenges. A reflective meeting identified a need for more meetings with the students, particularly at the beginning of the course. In addition, in future, students will be advised to attend face-to-face tutorials wherever possible. The Year 12 student found it difficult to cope with the demands of their Higher School Certificate as well as the CAP, and Year 12 students will not be invited in future. There also needs to be more communication between the course coordinator and the students as well as better communication with the in-school mentors. A role statement for the mentors needs to be developed.

Student results

A program such as the CAP can only be judged when it is tested or by its results. The students' final grades are thus an important measure of success for the program. It must be remembered that these students had to adapt to university expectations whilst studying independently. Of the five students who participated, three were in Year 10, one in Year 11 and one in Year 12. The following are their results:

- Year 10 students – all male – two Passes and one Distinction.
- Year 11 student – male – Credit.
- Year 12 student – female – Pass.

Feedback from students

Students completing the program echoed the observations of Taylor who noted that “the majority of (participants) expressed confidence, enthusiasm and satisfaction over the transition process and early career experiences.” Taylor (2004). The following are some of the observations students made:

- “Great opportunity”.
- “Really enjoyed the program and found it challenging. The work was time consuming but I had no difficulty managing the work”.
- “I needed help with the first assignment so that I knew the standard that was expected”.
- “The discussion board on Blackboard was useful. I didn't feel confident enough to post a question but I liked to read the comments from the other students”.
- “I really enjoyed the course. I will use this subject in my Degree”.
- “This program has impacted on my subject choice, career goals and self-confidence”.
- “The course was really good and exciting. It gave an introduction to the University environment and atmosphere and I recommend it to other students... It was really informative and knowledge providing. The Blackboard was really exciting”.
- “The course has definitely been a positive experience. It has been a good introduction to the University of Newcastle. I would highly recommend this course to other students”.
- “This course was a great experience in the University atmosphere. It gave a good introduction to the University of Newcastle. I would highly recommend this course to other students”.
- “The course has greatly benefitted me and has been a fantastic experience that I will never forget. I would highly recommend this course to other students who would like to succeed further in their studies”.
- “This course was a great experience in the University atmosphere. It gave a good overview of expectations and required skills to complete the course”.
- “This course provides a good introduction to the University experience and a good link between high school and the university.”

Feedback form the Project Officer

A Project Officer was employed by Callaghan College on behalf of the NCTTC, working one day per week on this program as well as on others. On completion of the Semester 1 pilot, the Officer made several observations about the CAP, including that the initial orientation and related paperwork needed to be completed prior to start of the course. Students needed to ensure they were registered on the University's website and enrolled in the correct course prior to the start of semester. Students should email the course coordinator and familiarise themselves with Blackboard. In addition, students should sign a form confirming that they have read and understood when assignments are due. Hand-in dates for the assignments were highlighted in their University information pack but students need to be aware that if they are completing a University course they need to take ownership of submission dates. Parents also need to be aware that students have to take ownership of this.

Further points identified by the Project Officer mentioned the need for a support person (mentor) to be identified prior to the start of the course. This person should be based at his/her own school and should receive a letter outlining the CAP and what their involvement in it should be.

Students must contact the course coordinator regularly to let them know how they are progressing. They should also contact mentors prior to and after each assignment. After each assignment the Program Coordinator from Callaghan College should have a follow-up discussion with each student individually or as part of a group to see how they are coping and how they found each assignment.

Feedback from School Mentors

Callaghan College also arranged for students to be supported by mentors at their respective schools. The following are a selection of the comments they made:

“The students need someone to hold their hand from the start. They are not familiar with how to navigate on Blackboard and its role and purpose other than tutorials and assessment and its capacity in relation to communication channels need to also be explored. While some support material was provided on how to correctly reference work- knowledge about what is a reliable source and what is considered acceptable was a big learning curve. Students consider that Google and Wikipedia are OK! Greater support is needed in this area.” (Mentor 1)

“I made regular contact with my students. On each occasion they said that they were making good progress and didn't require any extra assistance.” (Mentor 2)

“I didn't have much contact with my student. They didn't appear to need my assistance.” (Mentor 3)

Feedback from University

The CAP provided an ideal opportunity for universities to reach out to local schools. Publicising the CAP raised awareness of built environment courses to staff and students at the schools. The interactions with Callaghan College have been warm and constructive, and have encouraged closer participation between those involved (this paper being evidence of such interaction). The University will continue to support the College and the NCTTC wherever it can.

Construction Ecology 1 is offered on-line and as an elective, and resulted in minimal additional workload. Notwithstanding this, some additional support for CAP students was provided, but rather than being onerous, staff were heartened by the enthusiasm of the students and CAP staff.

Next steps

As a result of the experience gained in this pilot implementation, the CAP will be continued in Semester 2, 2010. Five students will take part, two of whom completed the Semester 1 course. They will enrol in 'Communication in the Built Environment 2', a course which is delivered in a similar manner to the one described above. It aims to develop students' basic understanding and technical ability in designing and communicating using digital media. No previous experience in that field is required. Learning activities are structured around an introduction to CAD, development of a CAD model, its refinement, and the creation of rendered images and drawings, and applying and practising these skills using relevant software (e.g. ArchiCAD and Photoshop)

Assessment items require students to select one of the projects provided and for them to analyse and develop missing information (e.g. elevations that are omitted) based on information provided from plans or project photos. Finally, students need to create a CAD model of their project and generate drawings.

These assignment tasks as well as the mode of delivery used develop students' problem-solving skills. They work autonomously but they also develop a spirit for teamwork by helping each other in online discussions. This introduces them to the university environment and supports them in transitioning between high school and university. It should be noted that, at the time of writing, this course is still in progress. It may be that high school students need to develop other skills such as time management skills and being well organised. An online induction will help on this and will become a requirement for the high school students.

Conclusions

The initial trial of the CAP has proven to be a success from a number of perspectives. That the school students were able to succeed at university level is an achievement in itself. However, this is even more noteworthy as the students were working predominantly by themselves and in an online environment. The confidence they have gained will stand them in good stead for their future endeavours. From the University's perspective, the CAP provided an excellent opportunity to reach out to local schools and raise awareness of the varied opportunities available in the built environment. Announcements at school assemblies and meetings ensured that the construction industry (so often associated with muddy boots, and unattractive working conditions) was seen in a different light. Another extremely positive outcome from the University's viewpoint is the intention of the students to continue their studies at Newcastle University.

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